

Sometimes It's the

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Twelve-fifteen p.m. on Oct. 16, 1968, seemed like a fine time for a dive. Winds were westerly and light, and seas were moderate. The men aboard the research vessel *Lulu* had confidence in their equipment, resulting from their considerable experience with its use.

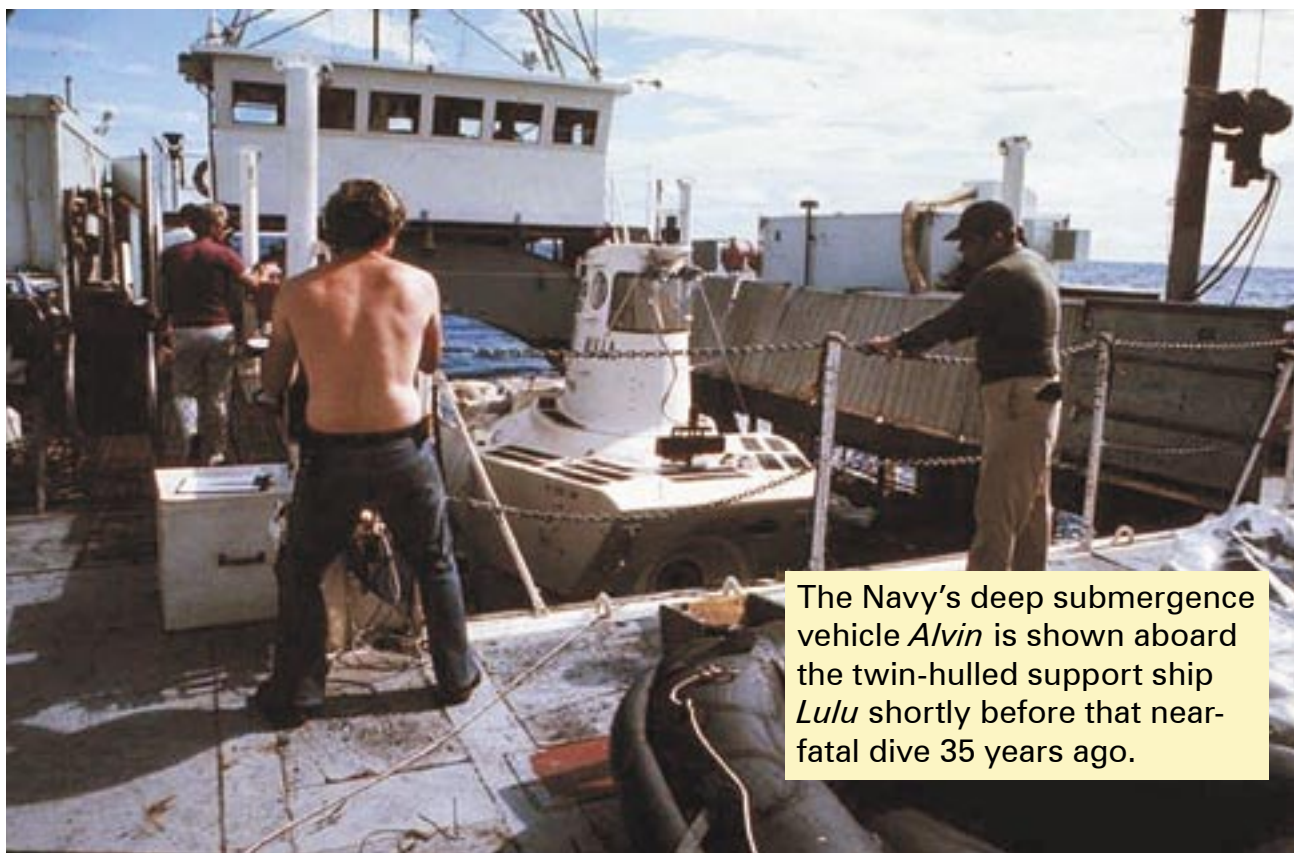
Neither confidence nor experience would help them that day.

Lulu and her civilian crew were operating some 120 nautical miles southeast of their home at Woods Hole, Mass. *Lulu* was a makeshift, twin-hulled support ship, and she carried the deep submergence vehicle *Alvin* [owned by the Office of Naval Research (ONR)]. Well-known today for pioneering work on the HMS *Titanic* and geothermal vents, *Alvin* earlier had earned fame when it located and helped recover a dropped hydrogen bomb off the coast of Almeria, Spain in 1966.

Woods Hole Oceanographic Institute (WHOI), a private organization, operated the submersible.

At 12:15, operators prepared for dive No. 308, the day's second dive. They had aborted an earlier dive because of an electrical ground in an external camera. After technicians made repairs, the submersible's crew readied their craft for the dive. Their mission was simple: Inspect a submerged buoy-array containing scientific measuring equipment.

Aboard *Alvin* were pilot Ed Bland, scientist Paul Stimson and observer Robert Weaver. Stimson and Weaver crouched inside the cramped, two-meter-diameter, steel, spherical pressure hull, while Bland directed launch activities from the sail. The hatch was open, following standard procedures of that time. *Alvin* rested on a cradle, supported at its four corners by thick, aluminized steel



The Navy's deep submergence vehicle *Alvin* is shown aboard the twin-hulled support ship *Lulu* shortly before that near-fatal dive 35 years ago.

Simple Things . . .



A year after sinking, *Alvin* comes to the surface, having been recovered by the privately owned submersible *Aluminaut*. The craft was refurbished and continues to serve the Navy.

cables. The cables, in turn, wound around large steel drums, which were controlled hydraulically.

Operators had lowered the cradle about a foot when both forward end cables parted almost simultaneously. A hydraulic line in the port winch motor ruptured at about the same time.

Alvin slid off her cradle and briefly submerged. When she bobbed back to the surface, Bland leaped to safety, but Stimson and Weaver had to scramble through the small hatch while sea water was pouring in. Fortunately, minor cuts and bruises were the only injuries sustained. Line handlers struggled for about a minute to keep the 14-ton submersible on the surface, but the weight of inrushing water proved too great, and *Alvin* plunged to the bottom in 5,000 feet of water.

An independent committee's investigation concluded the sequence of events was caused by:

- poorly maintained lift cables,
- poorly designed drum, sheave, and fair leads,
- contaminated and unfiltered hydraulic fluid,
- uneven loading on the lift cables, and
- hazardous launch procedures.

Three contributing factors were design problems; one was maintenance-related, and one was

a procedural problem. The relevance of hydraulic-fluid contamination to the casualty becomes apparent when examining the committee's assessment of the probable course of events. They concluded the forward port cable parted first. Poor maintenance had allowed the cable to rust and fray, deteriorating its strength. When it parted, the load transferred to the forward starboard cable, which likewise exceeded its breaking strength. When the cradle holding *Alvin* tipped downward, one of the operators inadvertently moved the hydraulic control valve to "lift," causing a high-pressure transient in the line. A hose connection, deteriorated by seawater, then burst. The committee did not blame the control operator for his action.



A camera from the submersible *Aluminaut* looks down on *Alvin* as the submersible rests on the ocean bottom almost a mile below the surface.



Quite a catch! *Alvin* is shown on the surface in a retrieving net upon recovery after spending a year on the ocean bottom almost a mile down.

Approximately a year after *Alvin*'s plunge to the bottom, the privately owned submersible *Aluminaut* raised her to the surface.

All deep-submergence systems owned or operated by the Navy are certified in accordance with Naval Sea Systems Command SS800-AG-MAN-010/P-9290, System Certification Procedures and Criteria Manual for Deep Submergence Systems. Following the *Alvin* mishap, NavSea revised this manual to include certification of man-rated, deep-submergence-system handling equipment. WHOI engineers redesigned *Alvin*'s handling equipment, upgraded maintenance standards, and revised the handling procedures to emphasize safety.

Since her recovery, *Alvin* has chalked up a commendable safety record while providing scientists and the public with numerous discover-



With things back to normal and after being overhauled following its recovery, *Alvin* continues to serve the Navy and is shown operating in its environment: the ocean depths.

ies and stunning pictures from the ocean depths. Ironically, manned descent down to thousands of feet wasn't the hazard that day in 1968—instead, danger lay in the simple, low-technology task of handling a small craft on the surface.

Sometimes, the simple things get you into trouble... ☹

Alvin's mishap on dive no. 308 didn't kill anyone, but two other deep-submersible mishaps during the past three decades had more tragic endings. Their stories are coming in future editions of *Fathom*.

On June 17, 1973, four men were operating the privately owned submersible *Johnson Sea Link*. That vessel had safely completed 129 dives but on this day, it became entangled in wreckage 360 feet down on the sea bottom. By afternoon of the next day, when a salvage vessel was able to raise the submersible, some crew members had died.

On Jan. 16, 1982, USS *Grayback* (SS 574) was conducting routine dive-training operations, and inside one of the boat's two large diving chambers, six divers awaited re-entry into the submarine. They lost consciousness when a vacuum was created during an improperly conducted chamber drain-down process, ending in tragic consequences.

The Navy continues to work with civilians with deep submergence systems at sea. Like with *Alvin*, *Johnson Sea Link*, and *Grayback*, these people are familiar with their equipment and—in most cases—have dived safely for years. But mishaps still can happen. What, if anything, is different? Certainly, the Naval Sea System Command's certification process is more rigorous, and NavSea's design methods have improved. Maintenance standards are tougher.

Read about the tragedy aboard the *Sea Link* in our October-December 2003 issue. In the January-March 2004 edition, you'll read about the diving tragedy aboard the USS *Grayback* (SS 574).

You'll also read on how deep sea submersible work is continuously improving with technology and how safety is at the forefront with the men and women who work at the ocean's depths. ☺